The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full name or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/ SE

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:
The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA | Date of receipt of DEMAND

Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION

Applicant's or agent's file reference: PCT-MEX-1

International application No.: PCT/SE00/00487
International filing date *(day/month/year)*: 13-03-2000
(Earliest) Priority date *(day/month/year)*: 18-03-1999

Title of invention: DEVICE FOR GENERATING MECHANICAL VIBRATION

Box No. II APPLICANT(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

ANDERSSON, Ulf, Bertil
Ö. Strandgatan 3
S-371 38 Karlskrona

Telephone No.: +46 455 80596
Facsimile No.: +46 455 80552
Teleprinter No.:

State *(that is, country)* of nationality: Sweden
State *(that is, country)* of residence: Sweden

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:
State *(that is, country)* of residence:

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

State *(that is, country)* of nationality:
State *(that is, country)* of residence:

☐ Further applicants are indicated on a continuation sheet.

See Notes to the demand form

Sheet No. 2

International application No. PCT/SE00/00487

Box No. III AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The following person is ☐ agent ☐ common representative

and ☐ has been appointed earlier and represents the applicant(s) also for international preliminary examination.

☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.

☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

Telephone No.:

Facsimile No.:

Teleprinter No.:

☐ **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION

Statement concerning amendments:*

1. The applicant wishes the international preliminary examination to start on the basis of:

☒ the international application as originally filed

the description ☐ as originally filed
☐ as amended under Article 34

the claims ☐ as originally filed
☐ as amended under Article 19 (together with any accompanying statement)
☐ as amended under Article 34

the drawings ☐ as originally filed
☐ as amended under Article 34

2. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.

3. ☐ The applicant wishes the start of the international preliminary examination **to be postponed** until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination:

☐ which is the language in which the international application was filed.
☐ which is the language of a translation furnished for the purposes of international search.
☐ which is the language of publication of the international application.
☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.

Box No. V ELECTION OF STATES

The applicant hereby **elects all eligible States** *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes **not to elect:**

Sheet No. 3

International application No. PCT/SE00/00487

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:		For International Preliminary Examining Authority use only: received	not received
1. translation of international application	sheets	☐	☐
2. amendments under Article 34	sheets	☐	☐
3. copy (or, where required, translation) of amendments under Article 19	sheets	☐	☐
4. copy (or, where required, translation) of statement under Article 19	sheets	☐	☐
5. letter	sheets	☐	☐
6. other *(specify)*	sheets	☐	☐

The demand is also accompanied by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ nucleotide and or amino acid sequence listing in computer readable form
6. ☐ other *(specify)*:

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

Ulf Andersson

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:
2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):
3. ☐ The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4 or 5, below, does not apply. ☐ The applicant has been informed accordingly.
4. ☐ The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5.
5. ☐ Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82.

For International Bureau use only

Demand received from IPEA on:

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference PCT-MEX-1	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE00/00487	International filing date *(day/month/year)* 13.03.2000	Priority date *(day/month/year)* 18.03.1999
International Patent Classification (IPC) or national classification and IPC7 E01C 19/28, E01C 19/38, E02D 3/074, B06B 1/16		
Applicant Andersson, Ulf Bertil		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11.10.2000	15.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Telex 17978 PATOREG-S Facsimile No. 08-667 72 88	Authorized officer Örjan Nylund / MRo Telephone No. 08-782 25 00

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00487

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☐ the description: _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
pages _____

☐ the claims: _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____
pages _____

☐ the drawings: _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
pages _____

☐ the sequence listing part of the description: _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____
pages _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00487

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-4	YES
	Claims		NO
Inventive step (IS)	Claims	1-4	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-4	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The present invention concerns a device for generating mechanical vibration, intended primarily for dynamic compaction of various sorts of material.

The object of the invention is to optimise compaction with consideration to many different types of material being compacted using one and the same device.

The solution according to the invention is to provide a device where creation of mechanical vibrations is made by a system (1) with two or more force cells (2) with rotating force vectors, where the resulting force vector of all force cells acts on a mass (3). Each force cell (2) consists of a rotating eccentric (10) driven by a separate electrically controlled motor (11) that is mechanically coupled to an angle sensor (12) for measuring the angular position of the respective eccentric in relation to a reference direction.

The cited documents describe different devices provided with a least two rotating eccentric masses. The angular relationship between them can be adjusted in order to change the resultant vibratory force generated.

However, none of the cited documents describe a device as defined in claim 1 where a resulting force vector of all force cells (2) with rotating force vectors acts on a mass (3) and where each force cell includes a rotating eccentric driven by a separate electric drive. The invention claimed in claim 1 is therefore novel. It can also be considered to involve an inventive step and to have industrial applicability.

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT OR THE DECLARATION

(PCT Rule 44.1)

To:

Andersson, Ulf Bertil
Ö.Strandgatan 3
SE-371 38 KARLSKRONA
Sverige

Date of mailing *(day/month/year)*	17-07-2000
Applicant's or agent's file reference: PCT-MEX-1	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No.: PCT/SE00/00487	International filing date *(day/month/year)*: 13-03-2000
Applicant: Andersson, Ulf Bertil	

1. [X] The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:
The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the international search report: however, for more details, see the notes on the accompanying sheet.

Where? To the International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland
Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see notes on the accompanying sheet.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. [ ] **With regard to the protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

[ ] the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

[ ] no decision has been made yet on the protest: the applicant will be notified as soon as a decision is made.

4. **Further action(s):** The applicant is reminded of the following:

Shortly after **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90*bis*.1 and 90*bis*.3, respectively, before the completion of the technical preparations for international publication.

Within **19 months** from the priority date, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later).

Within **20 months** from the priority date, the applicant must perform the prescribed acts for entry into the national phase before all designated Offices which have not been elected within 19 months from the priority date or could not be elected because they are not bound by Chapter II.

Name and mailing address of the ISA/ Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88 Telex 17978 PATOREG-S	Authorized officer Hanna Lantz Telephone No. 08-782 25 00

Form PCT/ISA/220 (January 1994)

(See notes on accompanying sheet)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PCT-MEX-1	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/SE 00/00487	International filing date *(day/month/year)* 13 March 2000	(Earliest) Priority Date *(day/month/year)* 18 March 1999
Applicant Andersson, Ulf Bertil		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. [ ] **Certain claims were found unsearchable** (See Box I).

2. [ ] **Unity of invention is lacking** (See Box II).

3. [ ] The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing
   - [ ] filed with the international application.
   - [ ] furnished by the applicant separately from the international application,
     - [ ] but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.
   - [ ] transcribed by this Authority.

4. With regard to the title,
   - [X] the text is approved as submitted by the applicant.
   - [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,
   - [X] the text is approved as submitted by the applicant.
   - [ ] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is:
   Figure No. 1
   - [X] as suggested by the applicant.
   - [ ] because the applicant failed to suggest a figure.
   - [ ] because this figure better characterizes the invention.
   - [ ] None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00487

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01C 19/28, E01C 19/38, E02D 3/074, B06B 1/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E01C, E02D, B06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9706308 A1 (WACKER WERKE GMBH & CO. KG), 20 February 1997 (20.02.97), abstract, details 1,2, 3,4	1-4
A	US 3871788 A (A. BARSBY), 18 March 1975 (18.03.75), abstract	1-4
A	US 5797699 A (U. BLANCKE ET AL), 25 August 1998 (25.08.98), abstract	1-4
A	DE 4218951 A1 (BLAUENSTEINER, K.), 15 October 1992 (15.10.92), abstract	1-4

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" erlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
15 June 2000

Date of mailing of the international search report
17 -07- 2000

Name and mailing address of the ISA/
Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM
Facsimile No. +46 8 666 02 86

Authorized officer
Örjan Nylund / MRo
Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 00/00487

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9706308 A1	20/02/97	CA 2202132 A	20/02/97
		DE 19529115 A	06/03/97
		EP 0789801 A	20/08/97
		JP 10507504 T	21/07/98
		US 5934824 A	10/08/99
US 3871788 A	18/03/75	AU 5163473 A	17/10/74
		CH 560809 A	15/04/75
		DE 2304942 A	09/08/73
		FR 2170777 A	14/09/73
		IT 980947 B	10/10/74
		ZA 7300627 A	31/10/73
US 5797699 A	25/08/98	AT 168731 T	15/08/98
		CA 2157428 A	30/03/96
		DE 4434779 A	04/04/96
		DE 59502876 D	00/00/00
		EP 0704575 A,B	03/04/96
		SE 0704575 T3	
		ES 2122404 T	16/12/98
		JP 8105011 A	23/04/96
DE 4218951 A1	15/10/92	NONE	

PCT

REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference *(if desired) (12 characters maximum)* PCT-MEX-1

Box No. I TITLE OF INVENTION

DEVICE FOR GENERATING MECHANICAL VIBRATION.

Box No. II APPLICANT

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

ANDERSSON, Ulf Bertil
Ö.Strandgatan 3
SE-371 38 Karlskrona
Sweden

[X] This person is also inventor.

Telephone No. +46 (0)455 80596

Facsimile No. +46 (0)455 80552

Teleprinter No.

State *(that is, country)* of nationality: Sweden

State *(that is, country)* of residence: Sweden

This person is applicant for the purposes of: [X] all designated States [ ] all designated States except the United States of America [ ] the United States of America only [ ] the States indicated in the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)*

This person is:

[ ] applicant only

[ ] applicant and inventor

[ ] inventor only *(If this check-box is marked, do not fill in below.)*

State *(that is, country)* of nationality:

State *(that is, country)* of residence:

This person is applicant for the purposes of: [ ] all designated States [ ] all designated States except the United States of America [ ] the United States of America only [ ] the States indicated in the Supplemental Box

[ ] Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as: [ ] agent [ ] common representative

Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*

Telephone No.

Facsimile No.

Teleprinter No.

[ ] **Address for correspondence:** Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

I

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) *(mark the applicable check-boxes; at least one must be marked)*:

Regional Patent

☒ **AP** **ARIPO Patent:** GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SL Sierra Leone, SZ Swaziland, TZ United Republic of Tanzania, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT

☒ **EA** **Eurasian Patent:** AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT

☒ **EP** **European Patent:** AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT

☒ **OA** **OAPI Patent:** BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT *(if other kind of protection or treatment desired, specify on dotted line)* .....

National Patent *(if other kind of protection or treatment desired, specify on dotted line)*:

☐ **AE** United Arab Emirates
☐ **AL** Albania .....
☐ **AM** Armenia .....
☐ **AT** Austria .....
☐ **AU** Australia .....
☐ **AZ** Azerbaijan
☐ **BA** Bosnia and Herzegovina .....
☐ **BB** Barbados
☐ **BG** Bulgaria .....
☐ **BR** Brazil .....
☐ **BY** Belarus .....
☐ **CA** Canada
☐ **CH and LI** Switzerland and Liechtenstein
☐ **CN** China .....
☐ **CR** Costa Rica .....
☐ **CU** Cuba .....
☐ **CZ** Czech Republic .....
☐ **DE** Germany .....
☐ **DK** Denmark .....
☐ **DM** Dominica
☐ **EE** Estonia .....
☐ **ES** Spain .....
☐ **FI** Finland .....
☐ **GB** United Kingdom
☐ **GD** Grenada
☐ **GE** Georgia .....
☐ **GH** Ghana .....
☐ **GM** Gambia
☐ **HR** Croatia .....
☐ **HU** Hungary .....
☐ **ID** Indonesia
☐ **IL** Israel .....
☐ **IN** India .....
☐ **IS** Iceland
☐ **JP** Japan .....
☐ **KE** Kenya .....
☐ **KG** Kyrgyzstan .....
☐ **KP** Democratic People's Republic of Korea .....
☐ **KR** Republic of Korea .....
☐ **KZ** Kazakhstan .....
☐ **LC** Saint Lucia
☐ **LK** Sri Lanka
☐ **LR** Liberia
☐ **LS** Lesotho .....
☐ **LT** Lithuania
☐ **LU** Luxembourg
☐ **LV** Latvia
☐ **MA** Morocco .....
☐ **MD** Republic of Moldova .....
☐ **MG** Madagascar .....
☐ **MK** The former Yugoslav Republic of Macedonia .....
☐ **MN** Mongolia
☐ **MW** Malawi .....
☐ **MX** Mexico .....
☐ **NO** Norway
☐ **NZ** New Zealand .....
☐ **PL** Poland .....
☐ **PT** Portugal .....
☐ **RO** Romania
☐ **RU** Russian Federation .....
☐ **SD** Sudan
☐ **SE** Sweden
☐ **SG** Singapore
☐ **SI** Slovenia .....
☐ **SK** Slovakia .....
☐ **SL** Sierra Leone .....
☐ **TJ** Tajikistan .....
☐ **TM** Turkmenistan .....
☐ **TR** Turkey .....
☐ **TT** Trinidad and Tobago .....
☐ **TZ** United Republic of Tanzania
☐ **UA** Ukraine .....
☐ **UG** Uganda .....
☐ **US** United States of America .....
☐ **UZ** Uzbekistan .....
☐ **VN** Viet Nam .....
☐ **YU** Yugoslavia .....
☐ **ZA** South Africa .....
☐ **ZW** Zimbabwe .....

Check-boxes reserved for designating States which have become party to the PCT after issuance of this sheet:

☐ .....
☐ .....

Precautionary Designation Statement: In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. *(Confirmation (including fees) must reach the receiving Office within the 15-month time limit.)*

See Notes to the request form

Box No. VI PRIORITY CLAIM ☐ Further priority claims are indicated in the Supplemental Box.

Filing date of earlier application (day/month/year)	Number of earlier application	Where earlier application is: national application: country	regional application:* regional Office	international application: receiving Office
item (1) 18-3-1999	9900990-4	Sweden		
item (2)				
item (3)				

☒ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) *(only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office)* identified above as item(s): (1)

** Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.*

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

Choice of International Searching Authority (ISA) *(if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used)* : ISA/ SE

Request to use results of earlier search; reference to that search *(if an earlier search has been carried out by or requested from the International Searching Authority)*:

Date (day/month/year)	Number	Country (or regional Office)
15-11-1999	SE99/00542	Sweden

Box No. VIII CHECK LIST; LANGUAGE OF FILING

This international application contains the following **number of sheets**:

request	:	3
description (excluding sequence listing part)	:	6
claims	:	1
abstract	:	1
drawings	:	6
sequence listing part of description	:	0
Total number of sheets	:	17

This international application is **accompanied** by the item(s) marked below:

1. ☒ fee calculation sheet
2. ☐ separate signed power of attorney
3. ☐ copy of general power of attorney; reference number, if any:
4. ☐ statement explaining lack of signature
5. ☐ priority document(s) identified in Box No. VI as item(s):
6. ☐ translation of international application into (language):
7. ☐ separate indications concerning deposited microorganism or other biological material
8. ☐ nucleotide and/or amino acid sequence listing in computer readable form
9. ☐ other *(specify)*:

Figure of the drawings which should accompany the abstract: 1

Language of filing of the international application: english

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

Ulf Andersson

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1. Date of actual receipt of the purported international application:
2. Drawings: ☐ received: ☐ not received:
3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application:
4. Date of timely receipt of the required corrections under PCT Article 11(2):
5. International Searching Authority (if two or more are competent): ISA/
6. ☐ Transmittal of search copy delayed until search fee is paid.

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PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

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in its capacity as elected Office

Date of mailing (day/month/year) 14 November 2000 (14.11.00)	
International application No. PCT/SE00/00487	**Applicant's or agent's file reference** PCT-MEX-1
International filing date (day/month/year) 13 March 2000 (13.03.00)	**Priority date** (day/month/year) 18 March 1999 (18.03.99)
Applicant ANDERSSON, Ulf, Bertil	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

11 October 2000 (11.10.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO
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1211 Geneva 20, Switzerland

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Authorized officer

Nestor Santesso

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

REC'D 25 JUN 2001
WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference PCT-MEX-1	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/SE00/00487	International filing date *(day/month/year)* 13.03.2000	Priority date *(day/month/year)* 18.03.1999
International Patent Classification (IPC) or national classification and IPC7 E01C 19/28, E01C 19/38, E02D 3/074, B06B 1/16		
Applicant Andersson, Ulf Bertil		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 3 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
11.10.2000	15.06.2001
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. 08-667 72 88	Telex 17978 PATOREG-S
Authorized officer Örjan Nylund / MRo Telephone No. 08-782 25 00	

Form PCT/IPEA/409 (cover sheet) (January 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00487

I. Basis of the report

1. With regard to the **elements** of the international application:*

☒ the international application as originally filed

☐ the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the claims:
pages _____, as originally filed
pages _____, as amended (together with any statement) under article 19
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the drawings:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

☐ the sequence listing part of the description:
pages _____, as originally filed
pages _____, filed with the demand
pages _____, filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, Nos. _____

☐ the drawings, sheet/fig _____

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2 (c)).**

* *Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*

** *Any replacement sheet containing such amendments must be referred to under item I and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/SE00/00487

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-4	YES
	Claims		NO
Inventive step (IS)	Claims	1-4	YES
	Claims		NO
Industrial applicability (IA)	Claims	1-4	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

The present invention concerns a device for generating mechanical vibration, intended primarily for dynamic compaction of various sorts of material.

The object of the invention is to optimise compaction with consideration to many different types of material being compacted using one and the same device.

The solution according to the invention is to provide a device where creation of mechanical vibrations is made by a system (1) with two or more force cells (2) with rotating force vectors, where the resulting force vector of all force cells acts on a mass (3). Each force cell (2) consists of a rotating eccentric (10) driven by a separate electrically controlled motor (11) that is mechanically coupled to an angle sensor (12) for measuring the angular position of the respective eccentric in relation to a reference direction.

The cited documents describe different devices provided with a least two rotating eccentric masses. The angular relationship between them can be adjusted in order to change the resultant vibratory force generated.

However, none of the cited documents describe a device as defined in claim 1 where a resulting force vector of all force cells (2) with rotating force vectors acts on a mass (3) and where each force cell includes a rotating eccentric driven by a separate electric drive. The invention claimed in claim 1 is therefore novel. It can also be considered to involve an inventive step and to have industrial applicability.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 7 : E01C 19/28, 19/38, E02D 3/074, B06B 1/16 — A1

(11) International Publication Number: WO 00/55430

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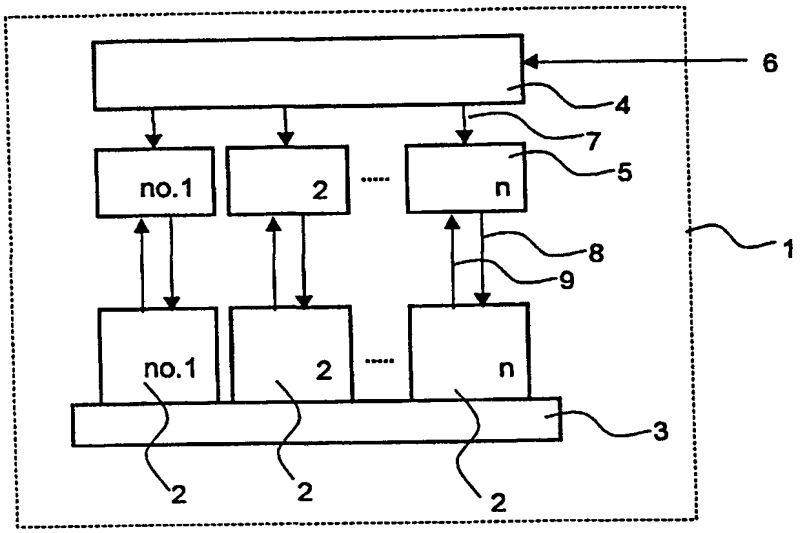
9900990–4 18 March 1999 (18.03.99) SE

(71)(72) Applicant and Inventor: ANDERSSON, Ulf, Bertil [SE/SE]; Ö.Strandgatan 3, S–371 38 Karlskrona (SE).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: DEVICE FOR GENERATING MECHANICAL VIBRATION



(57) Abstract

The invention concerns a device where creation of mechanical vibration is made with a system (1) of two or more rotating eccentrics (10). Each eccentric (10) is rotated by an individually controlled motor (11) and the angle position of each eccentric (10) is read by an angle sensor (12). With a control and monitoring system (5), the rotation frequency, direction of rotation and phase position of each eccentric (10) can be controlled. By choosing a number of eccentrics, mass of the eccentrics, rotation frequency, direction of rotation and phase position, a force vector diagram of suitable form, in space and time, can be generated. The invention is intended primarily for use in appliances for dynamic compaction of various materials.

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VN	Viet Nam
YU	Yugoslavia
ZW	Zimbabwe

DEVICE FOR GENERATING MECHANICAL VIBRATION.

The invention presented concerns a device for generating mechanical vibration, intended primarily for dynamic compaction of various sorts of material.

For compacting various materials, e.g., in the construction of roads, airfields, vibratory compaction equipment is used to increase the compaction capacity and optimise the result of the compaction work.
Optimisation can consist, for example, of increasing the density of the material, increasing its bearing capacity, achieving a certain density profile with regard to depth and of obtaining a particular surface structure.
The equipment used can, for example, be rollers that have one or more vibrating drums, self-propelled vibratory plates, vibratory pokers and tampers.

To create the vibration, various types of mechanical systems having rotating eccentrics that utilise centrifugal force are used. This gives in space a rotating circular force vector and in time a sine shaped force vector in a certain direction.

To optimise compaction with regard to properties of the compacted material it is necessary that the vibration be given varying frequency, amplitude and direction.

Known vibratory devices with rotating eccentrics alter parameters of the force vector in the following way:

Examples of systems with one eccentric for achieving a circular force vector with variable amplitude:

See, US-patent 5,618,133 Vibrating mechanism and apparatus for generating ...
US-patent 4,342,523 High-low force amplitude device
US-patent 4,221,499 Vibratory device
US-patent 3,966,344 Adjustable vibratory roller

Amplitude of the vibration is changed in that the centre of mass for the eccentric weight is displaced in relation to the rotation centre of the eccentric.
The vibration frequency is set with the speed of rotation of the rotating eccentric.
This is achieved at present by some type of mechanical system.

Systems with two eccentrics:
See US-patent 5,797,699 Process and apparatus for dynamic soil compaction.
A linear force vector is obtained by the two eccentrics rotating in different directions of rotation and fully synchronised, ie, at the same speed of rotation.
By phase displacement of the eccentrics so that the direction is changed as the eccentrics pass each other, the force vector can be controlled to act in varying directions.
Phase displacement of the eccentrics is made by a mechanical system.
Vibration frequency is set with the speed of rotation of the rotating eccentrics.

Characteristic for present vibration systems is that they only permit some specific form of vibration and that complicated mechanical devices are required.

The object of the invention presented is to optimise compaction with consideration to many different types of material being compacted using one and the same device.

Figure 1 and 2 are schematic drawings of the device and figure 3 is a form of execution.

The invention is characterised thereby, in that the generation of vibration is made by a system 1 of two or more so-called force vector cells 2 and where a rotating eccentric 10 in each force vector cell generates a circular rotating force vector.
All force vector cells 2 generate a force vector that acts in the form of a resulting force vector on the common mass 3.
Each eccentric 10 is rotated by a separate electrically controlled drive 11, e.g., electric motor, hydraulic motor, and where the angular position of each eccentric in relation to a reference direction is measured by an angle sensor 12 with electric output signal 9.

Rotation of each eccentric with regard to rotation frequency, direction of rotation and phase position is controlled by a control and monitoring system 5 by a control signal 8 to the drive 11.

With control signal 6, a superior control device 4 determines signal 7, containing a rotation frequency, a direction of rotation and a phase position for each force vector cell 2 to achieve a determined resulting force vector diagram.
The control devices 4 and 5 are at present based on microcomputers for advanced control and monitoring and simple re-programming of the vibration characteristics.

By choosing a suitable number of eccentrics 10, centrifugal force of the eccentrics, frequency, direction of rotation and phase position, it is possible to generate a force vector diagram of suitable form, in space and time.

With one and the same configuration of force vector cells 2, many different types of force vector diagrams can be obtained.
The form of the resulting dynamic force vector diagram can easily be optimised with regard to factors such as the degree of compaction, direction of movement of the compacting appliance and the static force vector from the mass of the appliance.
The invention also allows the force vector diagram to be "modulated" by varying the speed of rotation and phase position of the eccentrics in time.
For the compacting of certain types of material, optimisation can be achieved since the vibration is composed of several different frequencies (multi-frequency vibration).
The invention described also allows an existing apparatus to be easily "re-programmed" to conform to force vector diagrams that have been tested and to new types of material that need to be compacted.

See figure 4–7 for some typical force vector diagrams that can be achieved:

Figure 4: Circular force vector diagram with adjustable amplitude:

The vibration system consists of two force vector cells, where the eccentrics rotate in the same direction and at the same rotational speed and where the phase difference can be regulated.

This results in a circular force vector with amplitude that is adjustable between 0 and maximum depending on the phase difference between the eccentrics.

The figure shows amplitude of the rotating force vector for the phase differences 0, 135 and 180°.

Figure 5: Force vector with adjustable direction and fixed amplitude,

The vibration system consists of two force vector cells, where the eccentrics rotate in opposite directions and at the same rotational speed and where their phase position can be regulated.

This results in a linear force vector that acts in one direction only (+/-) and at fixed amplitude. Direction of the force vector depends on when the centrifugal forces of both eccentrics interact in one direction for each revolution.

The figure shows how displacing the phase position 0, 90 and 45° in relation to the reference direction can turn the force vector.

Figure 6: Force vector with adjustable direction and fixed amplitude,

The vibration system consists of two force vector cells, where the eccentrics rotate in opposite directions and where eccentric 2 rotates at double the rotational speed compared to eccentric 1.

By giving eccentric 2 different phase positions a force vector diagram with different combinations of depth and surface effect can be obtained.

Figure 7A:

The vibration system consists of three force vector cells, where the eccentrics 1 and 3 rotate in the same direction and eccentric 2 in the opposite direction

Speed of rotation for eccentric 1 = 4 Hz, eccentric 2 = 8 Hz, eccentric 3 = 12 Hz.

Amplitude of eccentric 1 = 0.5, eccentric 2 = 0.41, eccentric 3 = 0.18.

With these settings a force vector that acts in depth for a short period is obtained. Changing the phase position of the eccentrics turns the direction.

Figure 7B:
The vibration system consists of three force vector cells, where the eccentrics 1 and 3 rotate in the same direction and eccentric 2 in the opposite direction.
Speed of rotation for eccentric 1 = 4 Hz, eccentric 2 = 8 Hz, eccentric 3 = 12 Hz.
Amplitude of eccentric 1 = 0.5, eccentric 2 = 0.5, eccentric 3 = 0.5.
With these settings a force vector is obtained that has combined surface and depth effect.
Changing the phase position of the eccentrics turns the direction.

The execution form according to figure 3 is a device with two force vector cells 2a, 2b, where the eccentrics have coaxial location. This implies that the outer eccentric 10a rotates round the inner eccentric 10b. This location means that the mass centre (centre of gravity) of the eccentrics has the same axis of rotation 17 and the same rotation plane 18, which is of significance for the resulting force vector for both of the eccentrics.
The axles 14a and 14b are carried by a number of bearings 16 so that they can rotate freely in relation to one another and to the holder 15.
The principle of coaxial located eccentrics can also be used for 3 or more eccentrics.
The cells are mounted on a common plate 3 the mass of which shall vibrate to compact the underlying material.
The eccentrics 10a, 10b rotate with the respective axle 14a and 14b, which are common for the respective electric motor 11a, 11b and respective angle sensor 12a, 12b.
The motor 11a, 11b is fed from the control device 5a, 5b by a voltage 8a, 8b that determines the direction and speed of rotation for the axle 14a, 14b.
From angle sensor 12a, 12b a signal 9a, 9b is given that is the angle value of the eccentric 10a, 10b in relation to a reference direction which, for example, can be in the horizontal plane.
The signal 7a, 7b from the control device 4 is the desired value for the direction of rotation, speed of rotation and phase position for the eccentric 10a, 10b.

From the signal 9a, 9b from the angle sensor 12a, 12b the control device 5a, 5b calculates the value of the real direction of rotation, speed of rotation and phase position for the eccentric 10a, 10b. Consequently, these values form the actual value of the control system.

The control device 5a, 5b regulates with the voltage 8a, 8b the electric motor 11a, 11b so that the desired value and the actual value are the same.

The signal 6 gives the parameters for the operational case to the control device 4. The parameters can for example be the frequencies for the vibration, form of the force vector diagram and modulation.

PATENT REQUIREMENTS

1. Device for generating mechanical vibration with rotating eccentrics (10) characterised by a system (1) with two or more force cells (2) with rotating force vectors, where the resulting force vector of all force cells acts on a mass (3) and where each force cell (2) consists of a rotating eccentric (10) driven by a separate electrically controlled drive (11) that is mechanically coupled to an angle sensor (12) for measuring the angular position of the respective eccentric in relation to a reference direction.

2. Device according to requirement 1 characterised by a superior control device (4) giving a signal (7) to a separate control and monitoring system (5) for each force cell for setting of fixed or variable direction of rotation, rotational speed and phase position in relation to a reference eccentric for each respective eccentric. The control and monitoring system (5) receives, via an output signal (9) from the angle sensor (12), information about the angle position of the eccentric and calculates the direction of rotation, speed of rotation and phase position of the eccentric and by means of the signal (7) regulates the correct direction of rotation, speed of rotation and phase position through a signal (8) to the drive device (11) of the respective eccentric.

3. Device according to requirement 1 and 2 characterised by the superior control device (4) receiving information about the parameters for a specific force vector diagram through a control signal (6) and determining the direction of rotation, speed of rotation and phase position of the eccentrics, the values of which are transmitted to all of the control and monitoring systems (5) through the signal (7).

4. Device according to requirements 1–3 characterised by the mass centre of the eccentrics (10) having approximately the same geometric axis of rotation (17) and that the mass centre of the eccentrics (10) rotates in approximately the same geometric plane (18).

Figure 1

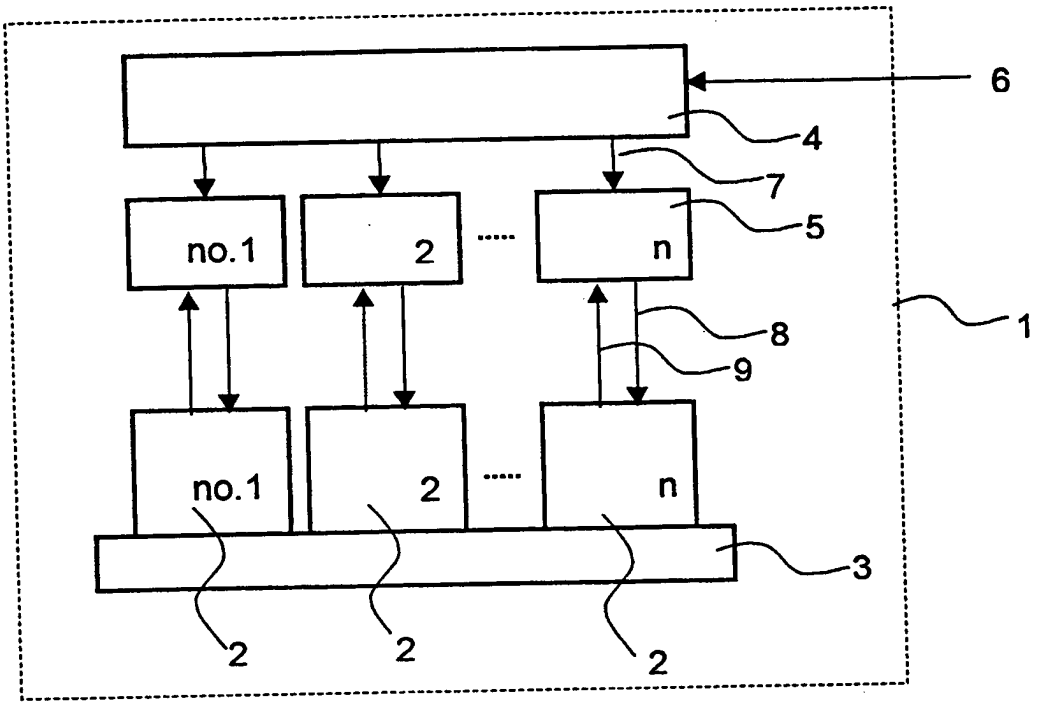
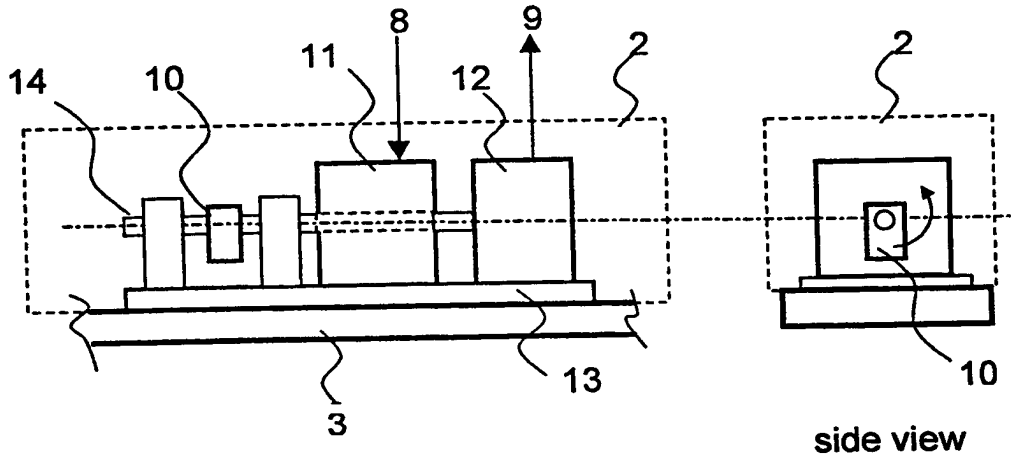


Figure 2



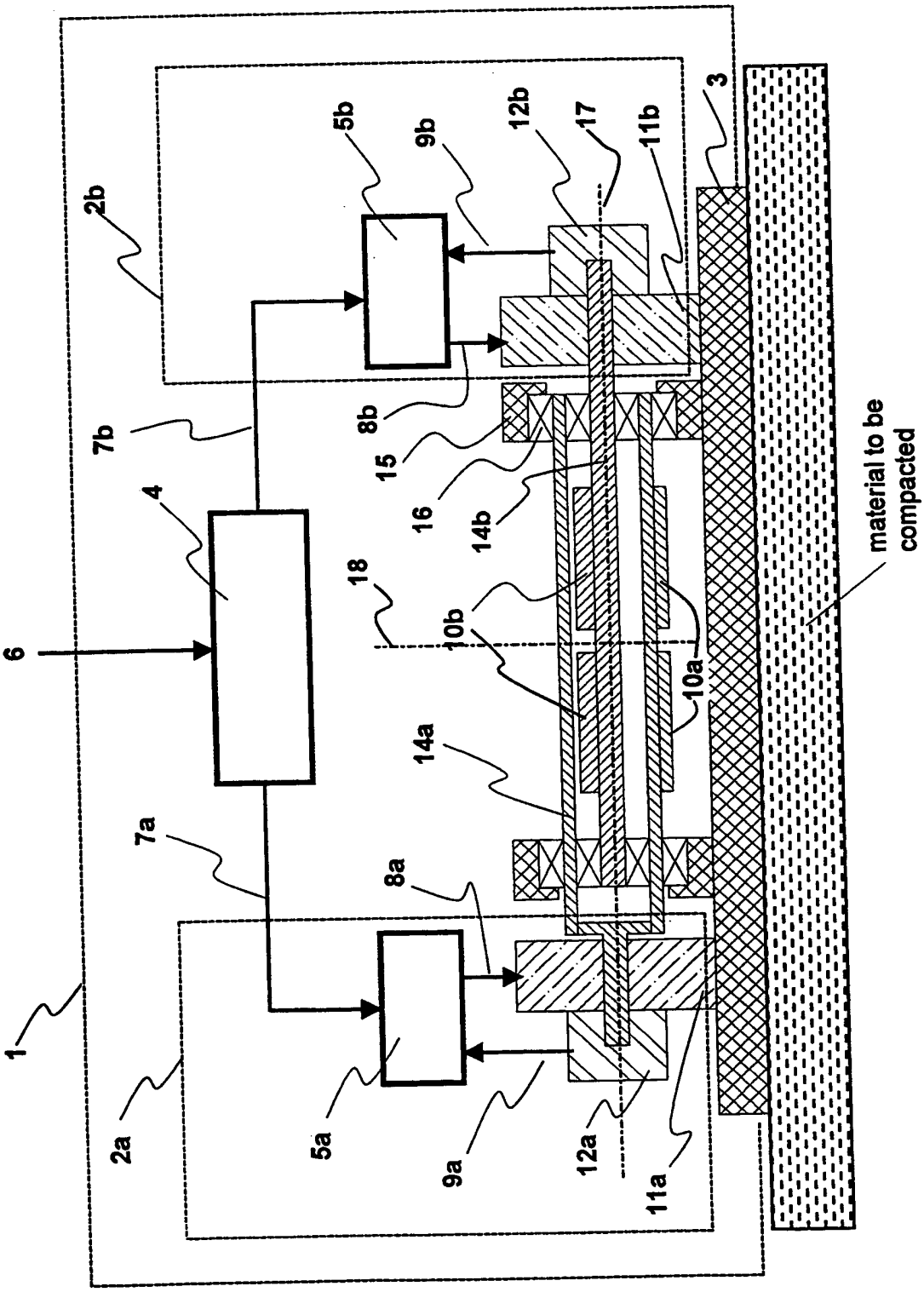

material to be compacted
1
2a
2b
3
4
5a
5b
6
7a
7b
8a
8b
9a
9b
10a
10b
11a
11b
12a
12b
14a
14b
15
16
17
18

Figure 3

Figure 4

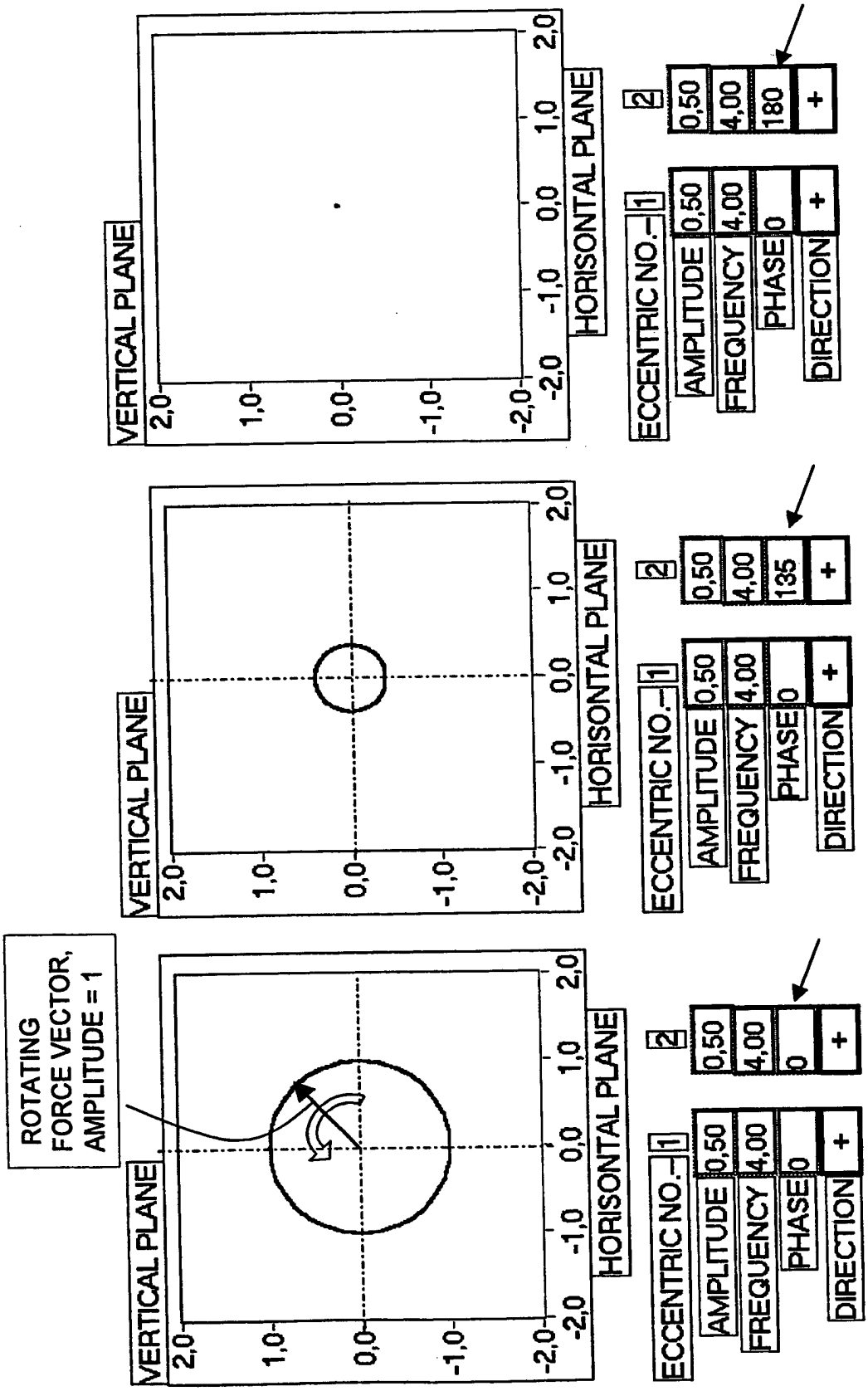
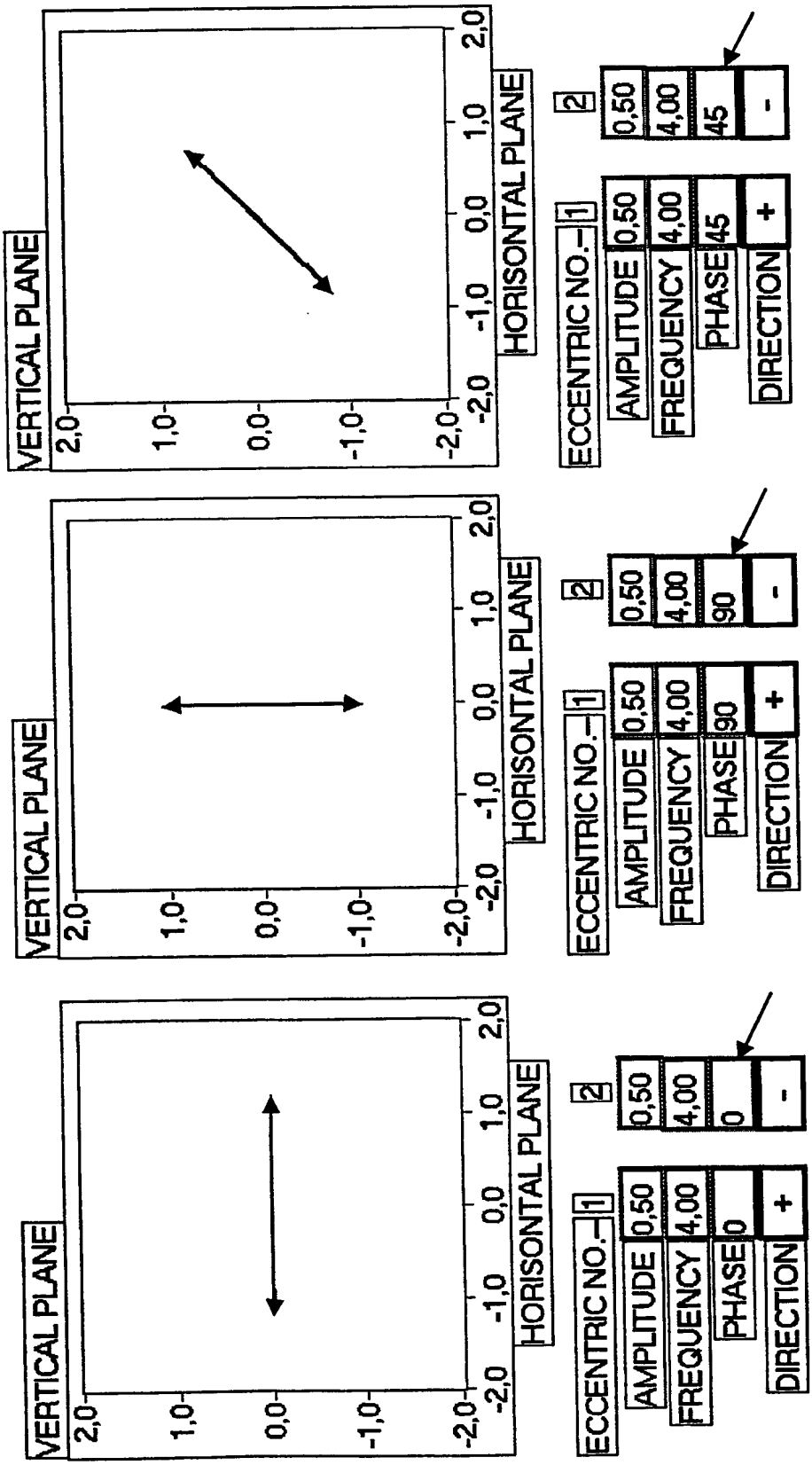

ROTATING FORCE VECTOR, AMPLITUDE = 1
VERTICAL PLANE
HORISONTAL PLANE
2,0
1,0
0,0
-1,0
-2,0
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 0
DIRECTION +
2
0,50
4,00
0
+
135
180

Figure 5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-1,0
-2,0
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 0
DIRECTION +
2
0,50
4,00
0
-
VERTICAL PLANE
HORISONTAL PLANE
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 90
DIRECTION +
2
0,50
4,00
90
-
VERTICAL PLANE
HORISONTAL PLANE
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 45
DIRECTION +
2
0,50
4,00
45
-

Figure 6

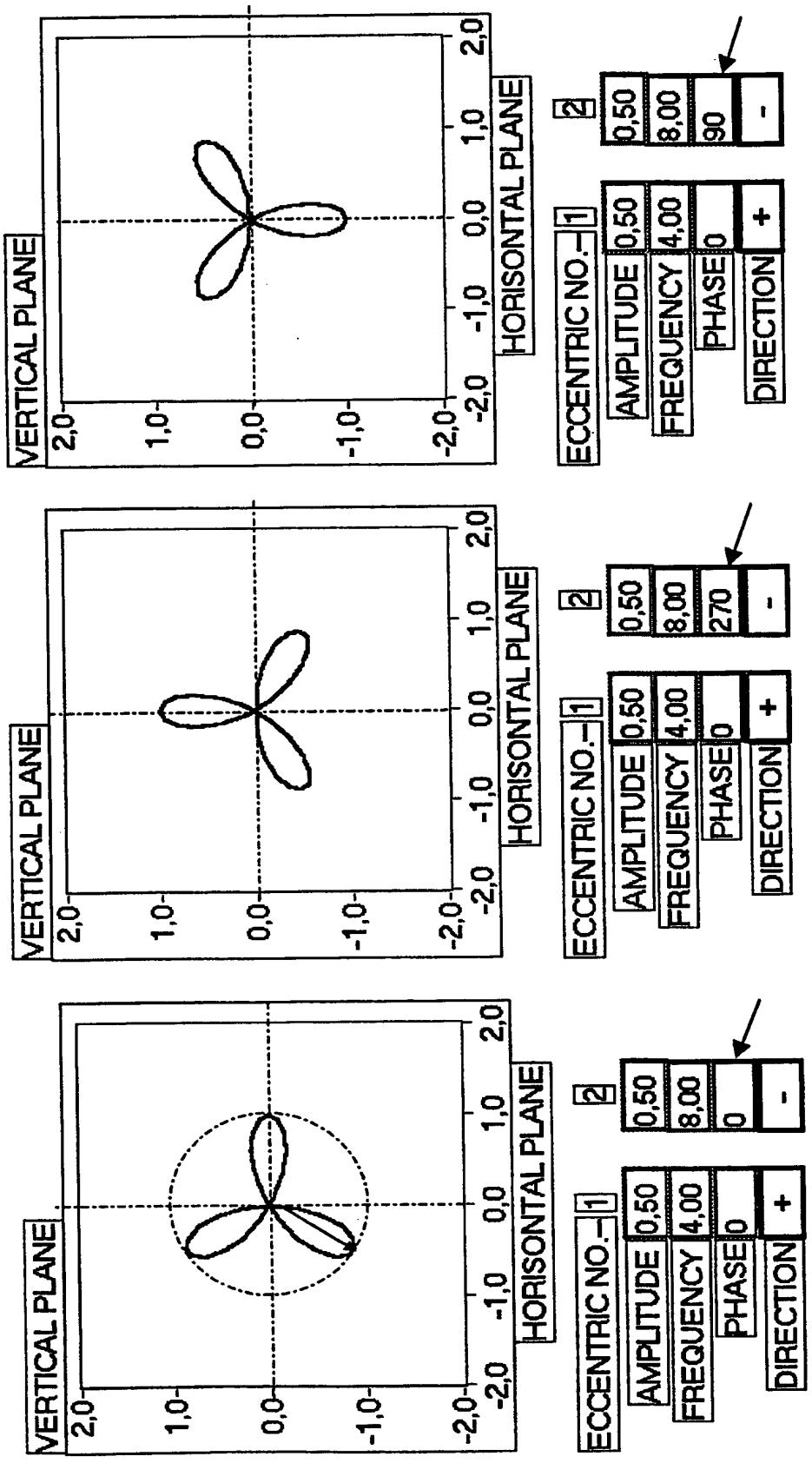

VERTICAL PLANE
HORISONTAL PLANE
2,0
1,0
0,0
-1,0
-2,0
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 0
DIRECTION +
2
0,50
8,00
0
-
VERTICAL PLANE
HORISONTAL PLANE
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 0
DIRECTION +
2
0,50
8,00
270
-
VERTICAL PLANE
HORISONTAL PLANE
ECCENTRIC NO.- 1
AMPLITUDE 0,50
FREQUENCY 4,00
PHASE 0
DIRECTION +
2
0,50
8,00
90
-

Figure 7B

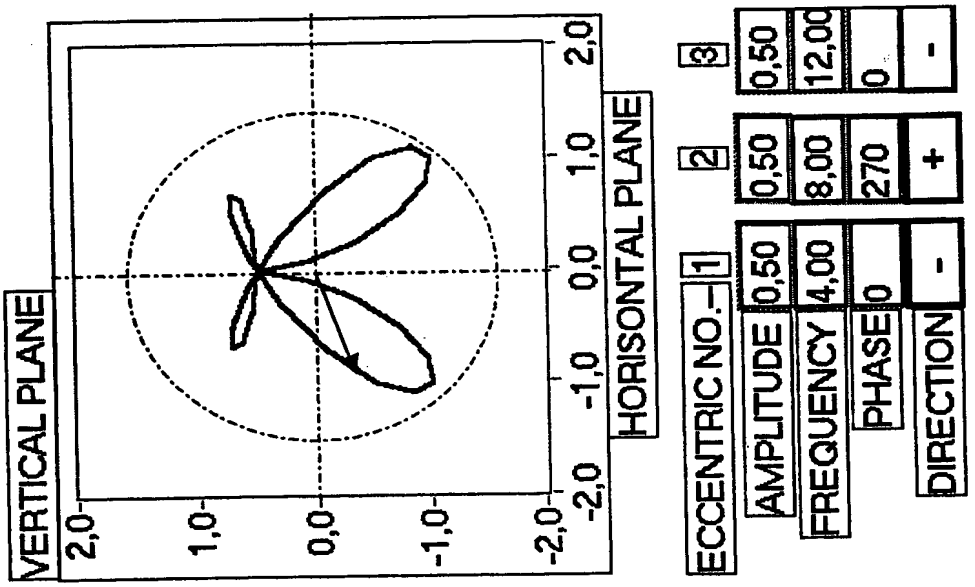
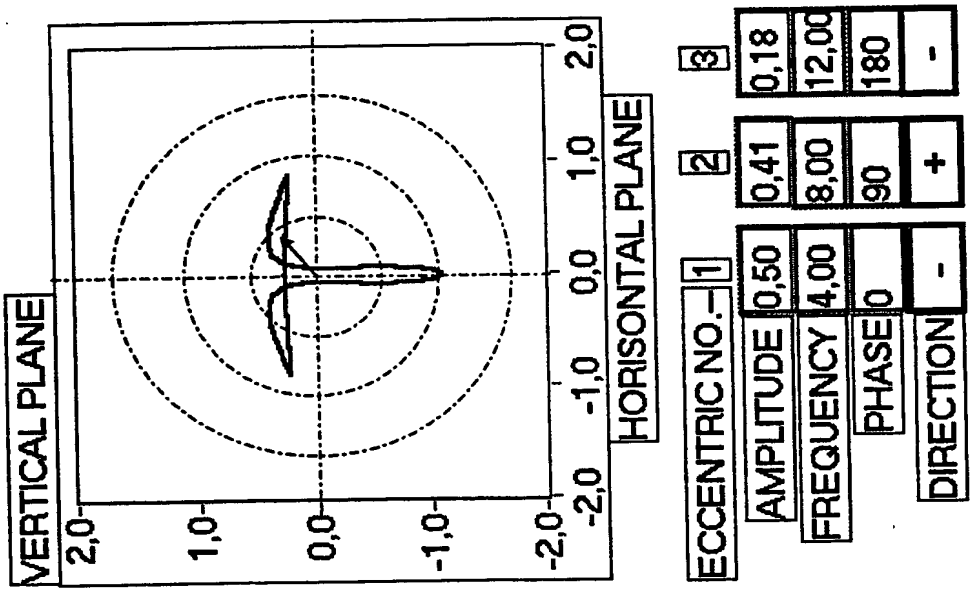


Figure 7A



INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 00/00487

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E01C 19/28, E01C 19/38, E02D 3/074, B06B 1/16
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E01C, E02D, B06B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9706308 A1 (WACKER WERKE GMBH & CO. KG), 20 February 1997 (20.02.97), abstract, details 1,2, 3,4	1-4
A	US 3871788 A (A. BARSBY), 18 March 1975 (18.03.75), abstract	1-4
A	US 5797699 A (U. BLANCKE ET AL), 25 August 1998 (25.08.98), abstract	1-4
A	DE 4218951 A1 (BLAUENSTEINER, K.), 15 October 1992 (15.10.92), abstract	1-4

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
15 June 2000	17 -07- 2000
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Örjan Nylund / MRo Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.
PCT/SE 00/00487

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